EMBRYOLOGY.[1]

ON THE PRIMARY SEGMENTATION OF THE GERM-BANDS OF INSECTS.[2]—Prof. Veit Graber summarizes his important results on the embryology of insects as follows:—

1. The germ-band of insects is at first either discoidal (*Stenobothrus, Œcanthus*), or is oblong (*Hydrophilus, Lina*, etc.). The primitive discoidal germinal area corresponds principally to the (Urkopf) antennal segment, since the (Urrumpf) primitive body has at first very limited dimensions.

2. In most insects with an elongate germ-band, the primitive head-segment is also the first to be separated. An exception to this is found in *Lina*—if *Hydrophilus* is not taken into account—in which two transverse furrows appear simultaneously, forming three principal segments, which appear to correspond to the principal subdivisions of the insect body (head, thorax and abdomen).

3. The primitive body (Urrumpf) of the germ-bands of *Stenobothrus* and *Œcanthus* does not segment, as it has been assumed in the case in all insects hitherto, but before the permanent segments (metameres or microsomites) are established, the latter definitive segmentation is preceded by a subdivision into two and then three large segments (macrosomites).

4. Of these three primary segments (macrosomites) of the primitive body, the first corresponds to the sum of the jaw-bearing (gnathophorous) metameres—gnathal macrosomites—the second, the sum of the limb-bearing metameres—thoracic macrosomites—and finally the third to the abdomen—abdominal macrosomites.

5. In the process of the primary or macrosomitic segmentation of the primitive body there is no external segmentation, that is, transverse subdivision of the ectodermal plate, but a total segmentation of the inner (lower) layer, the hypo- (or ento-) blast.

6. The secondary or microsomitic segmentation of the primitve body (segmentation of the microsomites into metameres) does not proceed in *Stenobothrus* and *Lina* (and also in spiders according to Morin), as is generally assumed, from before backwards, but it first involves the middle or thoracic (Ursegment) macrosomite.

We may finally inquire as to the morphological significance of the primary subdivision into four or tetramerism of the germ-bands of *Stenobothrus* and *Œcanthus*.

[1] Edited by Prof. John A. Ryder, Univ. of Penna., Philadelphia.

[2] Über die primäre Segmentirung des Keimstreifs der Insekten. Morph. Jahrb. xiv. Hft. ii. 1888. Pp. 345–368, pls. xiv.–xv. Von V. Graber.

Since the two last primary segments (Ursegmente), namely, the thoracic and abdominal, correspond to the two sections of the body of the perfect insect, we may regard the primary segmentation as an anticipation of the later or tertiary segmentation. Against such a view two important facts are opposed. First, it is not to be forgotten that the primary segmentation does not conform to the tretiary, in that the head in the former does not constitute a primitive segment, but is divided into two sharply distinguished and heterogeneous sections, the primitive head segment (Urkopf) and the gnathophorous macrosomite.

Secondly, against the hypothesis alluded to, the whole progress of segmentation is opposed. If the macrosomites of the primitive body were to persist, as such, together with their later subdivisions (microsomites), as stem-unities of a higher order, the above view would be to some extent justified. The relation is, however, altogether a different one, in that between the few and unequally segmented stage on the one hand, and the similarly segmented end-stage on the other, a many and unequally segmented middle stage is intercalated, which bears scarcely a recognizable trace of the earlier segmentation, and out of which the trimerism of the end-stage is developed anew by the fusion of certain groups of metameres.

If the tetramerism of the segmented primary stage may not be readily explained by the not very sharply expressed trimerism of the end-stage, its cause must, without doubt, be sought in certain definite conditions of segmentation of the ancestors of insects. But, as I would especially point out, may the tetramerous germ-band stage here under consideration be compared with other adult similarly segmented arthropods without taking other matters into account, since, independently of the fact that our germ-band is not an independent (completed) living organism, there is wanting all support to a legitimate comparison of its macrosomites with other arthropods with few segments, such as the Nauplius, for example.

ARCHÆOLOGY AND ANTHROPOLOGY.[1]

(Continued from page 856.)

Dr. Brinton presented a human vertebra from Tampa Bay, Florida, found in the bog deposits of the quarternary geologic period. Its peculiarity was that the bony structure had passed and been replaced by a deposit of iron called limonite, so that it was an iron instead of a bone vertebra.

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